

Simple, non-destructive measurement of equilibrium Relative Humidity to evaluate seed moisture levels using a hygrometer



Figure: eRH measurement of a sample of coriander seeds in a 350ml glass jar with a rubber seal. The jar was filled to the top before inserting a hygrometer (bought in the terrarium section of a pet shop) just under the lid

OBJECTIVE

For an optimal shelf life of seeds, it is crucial that seeds are dry enough. A method still widely used to measure moisture levels is to determine the proportion of water in the fresh weight, expressed in %, also known as moisture content. This method involves oven-drying the sample and weighing the seeds before and after, which is destructive and rather labour-intensive. Another inconvenience is that the recommended water content depends on the seed oil content and varies between 4 and 9%.

RESULT

Equilibrium relative humidity (eRH) is an alternative measure of the seed moisture level, also expressed in %. It can be measured by placing the seeds in an airtight container together with a hygrometer. The RH of the air will reach an equilibrium, being the eRH, which reflects the moisture level of the non-oil part of the seeds and is thus independent of the oil content. An eRH of around 30% is considered optimal for seed conservation. This method is non-destructive, requires less labour and is independent of the oil content of the seeds.

RECOMMENDATIONS

Material

- an airtight container (glass jar or hermetic box) and a hygrometer

Protocol

- Place seeds in the airtight container
- Add the hygrometer and close the container. Make sure you can read the hygrometer through the container or lid when closed, except if it is a digital hygrometer that can be read remotely.
- Place the container in the storage room at storage temperature
- Check the hygrometer regularly and wait until the RH is stable. The fuller the container the faster the equilibrium is reached. Usually, eRH is reached within 24 hours, or even within a few hours.
- If eRH is higher than 35%, it is recommended to dry the seeds further.
- Keep in mind that commercial hygrometers often have an accuracy of $\pm 2\%$.

If you are measuring the eRH of a seed sample, make sure that in the meantime the rest of the seed lot is stored under stable conditions or in an air-tight container. Otherwise, your sample might no longer be representative of your seed lot.

Also, keep in mind that RH varies with temperature. Thus, your eRH measurement is valid as long as temperature conditions are fairly stable.

ADDITIONAL INFORMATION

- A Practical Guide from the LiveSeeding project provides more practical advice and background knowledge on the topic of drying and storing vegetable seeds in organic small-scale and on-farm seed production: <https://organic-farmknowledge.org/tool/52128>
- The Seed Information Database (SID) is a compilation of seed biological trait data hosted by the Society for Ecological Restoration (SER). It offers an equilibrium moisture content calculator to estimate moisture content based on seed oil content, temperature and the measured eRH. The "use preset" option provides seed oil contents for several crop species. <https://ser-sid.org/viability/moisture-equilibrium>
- A similar calculation tool in Excel format is available for download from the website of the supplier of Drying Beads®. This tool provides average seed oil content for some additional crop species, which are not available on the SID. http://www.dryingbeads.org/?page_id=84

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Date: September 2024

LiveSeeding: Organic seed and plant breeding to accelerate sustainable and diverse food systems in Europe. Horizon Innovation Actions 2022 - 2026.

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Co-funded by
the European Union

Funded by the European Union, the Swiss State Secretariat for Education, Research and Innovation (SERI contract number 22.0412) and UK Research and Innovation (UKRI). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or REA, nor SERI or UKRI.



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